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Paper Abstract

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Currently in NASA's Deep Space Network (DSN), a single operator is responsible for operating a single communications link. A DSN communications link is a collection of devices used to track and communicate with an unpiloted spacecraft. Most of the tasks for controlling a DSN link are performed by human operators: they are given assignments that involve configuring and calibrating complex equipment, and they monitor and control these devices while tracking a spacecraft. Elsewhere we have reported on the technology in the Link Monitor and Control Operator Assistant (LMCOA), a system which automates much of what is involved in operating a link. A requirement now exists for a single operator to manage more than one communications link and up to several links at a time. This paper describes preliminary work on a prototype for a multi-link operator assistant, based on the technology in the LMCOA. The multi-link technology described here can potentially be applied to any system which requires real-time, system-level control and accurate monitoring of health, status, and configuration in an asynchronous environment of multiple similar activities. The commercial applications of this technique are numerous.

In expanding the LMCOA to handle multiple links, there are many issues to consider and scenarios to handle. Some of these issues are listed below and are currently being explored; solutions will be demonstrated in a prototype later this year. The approach to automation is based on the use of a Temporal Dependency Network (TDN), originally developed in the LMCOA. A TDN represents an activity by breaking it down into its component pieces and formalizing the precedence and other constraints associated with lower-level activities. In a multi-link environment, some issues to consider are : monitor and control of multiple TDNs; presenting an overview of the status of all links; providing easy navigation to displays within a link, assigning priority to problems occurring at the same time in multiple links; managing screen real-estate; scaling the system from handling 2 to several links; enabling the operator's focus of attention on one or another link; "handing over" a link to another operator when problems become critical. These and other issues will be discussed in detail in the paper.